Project Summary

Organization:	**Monterey Bay High School**
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Partner:	Carmel River Watershed Council

Area of Interest: **"Meaningful" Outdoor Experiences for Students**

Project Title: A Meaningful Outdoor Experience for Students: To Monitor the Health of the Carmel River and Carmel Watershed

Project Period: 09/01/2003 – 10/31/2004

Project Objectives:

- To provide a meaningful outdoor experience for all of the 650 students at Monterey Bay High School;
- To assess the environmental quality and health of the Carmel River and the impact these problems have on the entire watershed and the larger ecological system;
- To teach the students how to monitor fish traps, conduct water quality tests, measure stream flow, operate plant surveys, perform bird density measurements (point counts), sample invertebrate and plankton tows, and perform herpetology surveys along the River;
- To assist local agencies that are concerned with the health of the Carmel River, to maintain existing populations and to assist in restoring those that are in decline through habitat restoration work, community-based education programs and increased local involvement in environmental projects;
- To raise the student's social awareness, stimulate observation, motivate critical thinking, and develop problem-solving skills.

Summary of Work: To provide high school students with Meaningful Outdoor Experiences by assessing the environmental quality and health of the Carmel River and Watershed.

Total Federal Funds:	**$50,000**
Cost Sharing:	**$25,643**
Total Project Costs:	**$75,643**

Grant Proposal

Purpose of Project

Monterey Bay High School is requesting $50,000 from NOAA for Environmental Education Projects in the Monterey Bay Watershed to provide high school students with **Meaningful Outdoor Experiences** by assessing the environmental quality and health of the Carmel River and Watershed. The Carmel River Watershed Council will be our collaborative working partner during the course of the grant.

How

The project will take place over a one-year period of time, beginning September 1, 2003. It will consist of three phases: the preparation phase, the action phase, and the reflection phase. The preparation and reflection stages will each be 3 months long; the action phase will take place over a 6 month period.

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Preparation Phase

All of the 650 students at Monterey Bay High School (grades 9-12) will participate in the preparation phase. At the outset of the preparation phase, we will propose the question: What is the present health of the Carmel River and how does the river's health affect the entire watershed?

During this phase the students and the teachers will do the initial background research on the Carmel River. The students will hear guest lectures delivered by our partner the Carmel River Watershed Council, and other state and local organizations that will be collaborating with us on this project (Carmel River Steelhead Association, Monterey Peninsula Audubon Society, Ventana Wilderness Society and the Monterey County Water Management District, California State Parks). These agencies will also supply us

with data previously collected that charts the Carmel River's vegetation, birds, wildlife, and fisheries, invertebrates and water quality. Certain problems will quickly become apparent to the students such as erosion, vegetation loss, coliform and other water pollutants, loss of wildlife densities and use of habitat, steelhead declines, and invertebrate declines. After discussion and analysis students will make their predictions about other potential problems in the Carmel River Watershed. We will then set up our goals to investigate in greater depth some of the problems associated with the River and the Watershed.

Action Phase
All of the students will participate in this field research phase. After a site visit to four selected Carmel River locations (upper Watershed, middle River site, site adjacent to the High School and Carmel River mouth), we will set up a phenological (timeline) schedule for sampling the sites with the students and the teachers. Each site will be sampled at least once per month over a six month period. Some of the activities and projects conducted at each site will include the monitoring of fish traps, conducting water quality tests, measuring stream flow, operating plant surveys, performing bird density measurements (point counts) and a bird banding program, sampling invertebrate and plankton tows, and performing herpetology surveys. All students will keep extensive journals, and record their observations and experiments at the River sites.

Reflection Phase
Following the six month research project at the Carmel River Watershed sites, the students and teachers will discuss their findings, refocus on the initial question, analyze the conclusions reached, and evaluate the results. We will also conduct appropriate assessment activities to evaluate the project and the learning achieved. The students will be divided into teams, and each team will write up a different aspect of each finding. The students will present this data to all interested stakeholders, including the Carmel River Steelhead Association, the Monterey County Water Management District, Monterey Regional Parks, California State Parks, the Ventana Wilderness Society and the Monterey Peninsula Audubon Society. Their conclusions will be used by these agencies to help evaluate further watershed studies, to maintain existing populations and to assist in restoring those that are in decline through habitat restoration work, community-based education programs and increased local involvement in environmental projects. Local media will report on our results and the projects that will take place as a result of the student's work.

Why

1- Demonstrate to students that local actions can impact the greater water environment (i.e. Monterey Bay). An intentional connection needs to be made to water quality, the watershed and the larger ecological system.

Through this project, the students will learn that the Carmel River is besieged with problems such as erosion, vegetation loss, coliform and other water pollutants, loss of wildlife densities and use of habitat, steelhead declines, and invertebrate declines. Part of

the Reflection phase will be used to study the impact these problems in the River have on the entire Watershed and the larger ecological system. As with all of the lessons we teach at our habitat, the students will learn about the connectedness of all living creatures and all actions, both large and small.

2- Experiences should include activities where questions, problems and issues are investigated through data collection, observation and hands-on activities.

Much of the work done throughout this project involves data collection, observation and hands-on activities. In the preparation phase, the students and teachers will be analyzing data previously collected by our partner organization, the Carmel River Watershed Council, on the vegetation, birds, wildlife and fisheries, invertebrates and water quality. In the action phase, the students and teachers will perform hands-on activities at four sites along the river, at least once a month at each site, over a six month period. These activities include the monitoring of fish traps, conducting water quality tests, measuring stream flow, operating plant surveys, performing bird density measurements (point counts) and banding birds, sampling invertebrate and plankton tows, and performing herpetology surveys. In the reflection phase, the students will examine the questions asked in light of the data they collected. They will then share their data with supporting local and state organizations so that some of the problems discovered can begin to be eradicated.

3- Experiences should stimulate observation, motivate critical thinking, develop problem solving skills and instill confidence in students.

There is no question but that this project will stimulate observation, motivate critical thinking, and develop problem solving skills. As a result, the students will acquire confidence, not only in their investigative skills, but also to be active participants in the public debate on many environmental issues. It is our experience that projects such as this one not only raise social awareness, but academic skills as well. It is a well known fact that students learn better by doing; by aligning the work done for this project with California state Standards (see number 7) the academic performance of the students will clearly be enhanced.

4- Activities should encourage students to assist, share, communicate and connect directly with the outdoors. Experiences can include: (1) Investigative or experimental design activities where students or groups of students use equipment, take measurements and make observations for the purpose of making interpretations and reaching conclusions; (2) Project-oriented experiences, such as restoration, monitoring, and protection projects, that are problem solving in nature and involve many investigative skills. These experiences should involve fieldwork, data collection and analysis.

As stated above, all of the activities for this project involve investigative or experimental design activities where the students use equipment, take measurements, and make observations for the purpose of making interpretations and reaching conclusions. In

addition, many of the activities in the action phase involve monitoring projects that are problem solving in nature and involve many investigative skills. All of the experiences involve fieldwork, data collection and analysis.

5- The "Meaningful" outdoor experiences need to be part of a sustained activity; the total duration leading up to and following the activity should involve a significant investment of instructional time.

Since many of the activities that will take place during all three phases will be aligned with the California State Standards, the "Meaningful" outdoor experiences will be embedded into the science curriculum (see number 7), and will encompass at least 10% of instructional time over the year period of the grant. This sustained activity will involve a significant outlay of instructional time, not just in the classroom, but in the field as well. As the budget narrative sets forth, all teachers, the principal investigator and the field coordinators will invest many hours preparing and teaching the lessons as well as helping the students to perform the tasks at the site.

6- An experience should consist of three general parts: a preparation phase-which focuses on a question, problem or issue and involves students in discussions about it; an action phase-which includes one or more outdoor experiences sufficient to conduct the project, make the observations or collect the data required; and the reflection phase- which refocuses on the question, problem, or issue, analyzes the conclusion reached, evaluates the results, and assesses the activity and the learning.

This project will consist of a preparation phase, an action phase and a reflection phase. The details of these are set forth above.

7- "Meaningful" outdoor experiences must be an integral part of the instructional program and clearly part of what is occurring concurrently in the classroom; aligned with the California academic learning standards; and make appropriate connections among subject areas and reflect an integrated approach to learning. Experiences should occur where and when they fit into the instructional sequence.

All of the sampling and research will be aligned with the California State Standards. For example, water sampling fits into our 9^{th} grade chemistry curriculum; erosion aligns with the earth science requirement for 10^{th} and 11^{th} grade; wildlife monitoring is part of the scientific investigation component that is required for all grade levels. In addition, this Project is a perfect complement to the River of Words program, where the students submit poetry and art to the international contest that is based on their experiences and observations of their Watershed (see description, above).

8- Project should demonstrate partnerships that form a collaborative working relationship, with all partners taking an active role in the project.

The Carmel River Watershed Council (CRWC) will be a collaborative working partner during the course of this grant. The CRWC is a nonprofit, community based organization

founded in 1999 to work with local, state and federal agencies for improved management of the Carmel River Watershed. The primary mission of the CRWC is the protection of the natural resources that form the Carmel River Watershed.

The CRWC will take an active role in this Project. During the course of this Project, they will provide the students and teachers at Monterey Bay High School with data that has been collected by them and other agencies concerning the vegetation, birds, wildlife and fisheries, invertebrates and water quality so that the students can assess and analyze the potential problems in the Carmel River. The principal investigator, is a consultant for the CRWC (and is also a teacher at the High School), will organize and coordinate the project, and provide, on an ongoing basis, expertise, teaching skills, and leadership to guide the staff in working with the students in the sampling of the river, monitoring of fish traps, conducting water quality tests, measuring stream flow, operating plant surveys, performing bird density measurements and bird banding, sampling invertebrate and plankton tows, and performing herpetology surveys. In all of these activities, he and other consultants at CRWC will work with the staff at the Biological Sciences Project and the participating teachers at the Monterey Bay High School to provide the students with a meaningful outdoor experience that will encourage them to have greater pride and ownership of their environment and become more effective and thoughtful community leaders and participants. The students will be doing important research that will benefit not only The Carmel River Watershed Council, but other local and state agencies, such as the Carmel River Steelhead Association, the Monterey County Water Management District, Monterey Regional Parks, California State Parks, the Ventana Wilderness Society and the Monterey Peninsula Audubon Society. All of the data that is gathered will be shared with these groups through student presentations and be used to evaluate future watershed activities that will help to maintain existing populations and assist in restoring ones that are in decline through habitat restoration work, community based education programs, and increased local involvement in community projects.

Who

The principal organization is the Monterey Bay High School. The Carmel River Watershed Council will be collaborating as our partner. Both organizations have been described in great detail, above.

The target audience is high school students, grades 9-12. All of the 650 students in the school will participate in all three phases of the project. The students and teachers at Monterey Bay High School, as well as the consultants that work with the Carmel River Watershed Council, have a great deal of experience using outdoor, hands-on activities as an integral part of the educational process. This project is an ideal and natural complement to the activities that take place at our habitat. We are committed to using the environment as a context for learning and improving the understanding of environmental stewardship of students and teachers. Many of the teachers at the school have extensive experience in teaching bird banding, data analysis and measurement and understand how to teach these types of scientific techniques to this age group of students. For those that do not have expertise in the subject matter that will be emphasized in this Project, the

Principal Investigator and other consultants from local agencies with expertise in these areas will provide **Professional Development** for the teachers.

The Project Manager for the Habitat will be coordinating this project and the Project Intern will assist in the gathering and computation of the data. Four teachers, all from the science department, will participate in all three phases of the Project, and will serve as field coordinators.

A consultant from the Carmel River Watershed Council, who is also a science teacher at the High School, will be directing the study and serve as the Principal Investigator. He will coordinate the three phases, oversee the teachers, and synchronize the visits and data collection during the action phase (see number 8, above).

Where

The Project will take place at Monterey Bay High School and on the Carmel River. The Carmel River is 36 miles long. It drains about 255 square miles while flowing NW out of the valley between the Santa Lucia Mountains on the South and the Sierra del Salinas to the North and East. The river empties into the Pacific Ocean near Carmel, California. The lower river flows from the mouth to the narrows, about 9 miles up stream; the middle river flows from the narrows to Camp Stephani; the upper river flows through rugged canyons.

We will set up four study sites: at the Carmel River mouth; at a site close to the High School, in the mid-Valley area; and at Cachagua Community Park below Los Padres Dam.

Need

This important project could not take place without government financial assistance. The financial health of the state and county budgets preclude funding for projects such as this one; in addition private grant funding is becoming increasingly difficult to secure. Without the financial aid of the federal government, these types of meaningful outdoor experiences for students could not take place.

Benefits or Results Expected

There are a number of benefits and results that will be derived from the proposed activities. First, the students will gather important data that will help to clarify what can be done to help bring the Carmel River and the Carmel Watershed to a state of good health. The students will be doing significant research that will benefit not only The Carmel River Watershed Council, but other local and state agencies, such as the Carmel River Steelhead Association, the Monterey County Water Management District, Monterey Regional Parks, California State Parks, the Ventana Wilderness Society and the Monterey Peninsula Audubon Society. All of the data that is gathered will be shared with these groups through student presentations and be used to evaluate future watershed

activities that will help to maintain existing populations and assist in restoring ones that are in decline through habitat restoration work, community based education programs, and increased local involvement in community projects.

In addition, the process of progressing through the preparation phase, the action phase and the reflection phase will to provide the students with a meaningful outdoor experience that will encourage them to have greater pride and ownership of their environment and become more effective and thoughtful community leaders and participants. This project will stimulate observation, motivate critical thinking, and develop problem solving skills. As a result, the students will acquire confidence, not only in their investigative skills, but also to be active participants in the public debate on many environmental issues.

Project Evaluation

We will employ various methodologies to insure that we are meeting the goals and objectives of our project. First, we will give pre and post tests to the students before the project begins and at its conclusion to determine if they have learned the science and skills that we want to teach through this project. In addition, students will be tested periodically throughout the course of the project as part of their coursework requirements.

Second, all students will keep extensive journals in which they will evaluate the data they have collected. At the end of the project, they will be asked to summarize their findings and submit them in a report. In addition, each student will be required to perform an independent science experiment that relates to the work being done at the River (i.e. measure the amount of nitrates in the water).

Third, the results of the data that is gathered will be presented by the students to the local and state agencies that are stakeholders in the Carmel River Watershed. These reports will be evaluated and critiqued by these agencies, along with suggestions for future studies.

Fourth, the students will use their experiences at the river as the basis for the art and poetry they submit to the River of Words competition that takes place each spring.

Finally, interested classes of incoming 9^{th} graders will be invited to take a trip to one of the sites where the High School students can mentor or teach them some of the skills that they have learned.